TECHNOLOGY UTILIZATION

TRANSFERABLE TECHNOLOGY

Publications Reporting Innovations Suitable for Many Purposes

FALL 1969

Office of Technology Utilization

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546

The National Aeronautics and Space Administration welcomes use of its technical resources by industries, organizations, and individuals serving the nation in a multitude of ways. The NASA Office of Technology Utilization issues Special Publications and Tech Briefs to inform potential users outside the aerospace industry about findings and innovations reported by NASA Research Centers, contractors, and subcontractors.

This pamphlet describes these Special Publications. They explain new concepts, designs, techniques, materials, and equipment. Some of them are surveys of broad fields. Some are detailed accounts of especially significant developments. Tech Briefs are terse announcements of new solutions to old problems, or novel solutions to unusual problems.

The Special Publications and Tech Briefs that are listed here reflect only a small fraction of the knowledge that is required to explore space. They emphasize new ideas and data that reviewers believe are likely to be useful in many different ways. They are addressed to engineers, scientists, managers, and technicians responsible for our health and prosperity. Students exploring biological, sociological, and other frontiers have found many of these publications helpful. So, too, have journalists and other observers of the impact of science and technology on human affairs.

The initials GPO preceding the price of a publication indicate that it may be purchased from the *Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.*

The initials CFSTI preceding the price of a publication indicate that it may be purchased from the *Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151.*

All of the publications described in this catalog were issued before June 30, 1969. To order one, please identify it both by its title and the "NASA SP" number assigned to it.

NASA Contributions to Bioinstrumentation Systems

By Gershon Weltman, Moshe Klagsbrun, Donald Ukkestad, and Ben Ettelson

Proper bioinstrumentation may bring about more efficient use of the time of medical personnel. This survey of devices and techniques developed to monitor Mercury and Gemini astronauts both clarifies the problem and describes recent advances toward its solution. The authors discuss system requirements, sensors and their attachment to human beings, signal transmission and conditioning, data processing and analysis, and fabrication of bioinstrumentation. The references and bibliography make this a valuable guide for workers in the numerous disciplines involved.

NASA SP–5054 1969 97 pp.
GPO $1.00

Signal conditioner fabrication.

NASA Contributions to Cardiovascular Monitoring

This survey describes new aids to measuring blood pressure, sensing external manifestations of cardiovascular forces, and attaching electrodes to the human body. It emphasizes nonspace uses of technology developed for manned space flights. NASA SP–5041 1966 43 pp. GPO 25 cents

Air-Pollution-Monitoring Instrumentation

By Alvin Lieberman and Peter Schipma

Thirty-two instruments and techniques developed for aerospace work were contributions to the state of the art of monitoring the atmosphere for pollution, according to these IIT Research Institute authors. This review of work done to monitor clean rooms, spacecraft cabins, and other areas covers both gas and vapor analysis and control, and particle collection and monitoring. A glossary and bibliography are included. NASA SP–5072 1969 74 pp. GPO 40 cents

Earthquake Prediction from Laser Surveying

This report by R. A. Fowler describes a dual-beam laser system developed by North American Aviation, Inc., subsequent to a Laser Space Communications Systems Study done under contract for NASA. The author discusses its use both to predict earthquakes and to measure the response of structures to earthquake activity.

NASA SP–5042 1968 32 pp. GPO 35 cents

Weather Satellite Picture Receiving Stations

By Charles H. Vermillion

Local weather services, radio and TV stations, scientists, farm cooperatives, and other interested persons in many different countries are now receiving cloud-cover pictures several times a day when American meteorological satellites pass overhead. This report describes an inexpensive way to construct ground equipment to receive pictures transmitted automatically from orbiting meteorological observatories. Such a station can be built from surplus parts costing less than $500. The antenna, FM receiver, and other components are described, and the operation of such a ground station is explained for technically oriented readers. This is an enlarged and improved version of NASA SP–5079 issued in 1968; it contains chapters on a facsimile video enhancement device and a direct readout infrared system not covered previously. NASA SP–5080 1969 83 pp. CFSTI $3.00

Joining Ceramics and Graphite to Other Materials

By H. E. Pattee, R. M. Evans, and R. E. Monroe

A Battelle Memorial Institute report covers selection of materials, joint configurations, surface preparation, and joining techniques that have made joining ceramics to metals less dependent on art. Bonding theories and ways of evaluating joints that must maintain their properties at high temperatures are discussed.

NASA SP–5052 1968 84 pp. GPO $1.00

Method of Brazing Aluminum to Stainless Steel for High-Stress-Fatigue Applications

By D. C. Martin

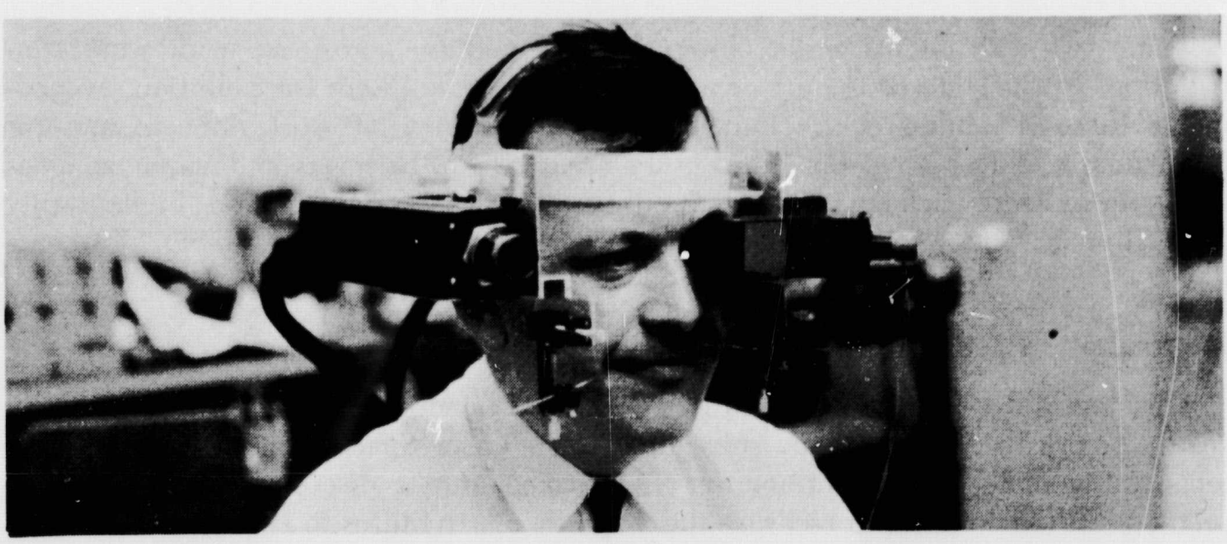
This short report describes a procedure for minimizing the formation of intermetallic compounds in aluminum-stainless steel joints. Developed for valve assemblies in rocket motors, it can be adapted to making many other parts.

NASA SP–5040 1968 11 pp. GPO 15 cents

Visual Information Display System

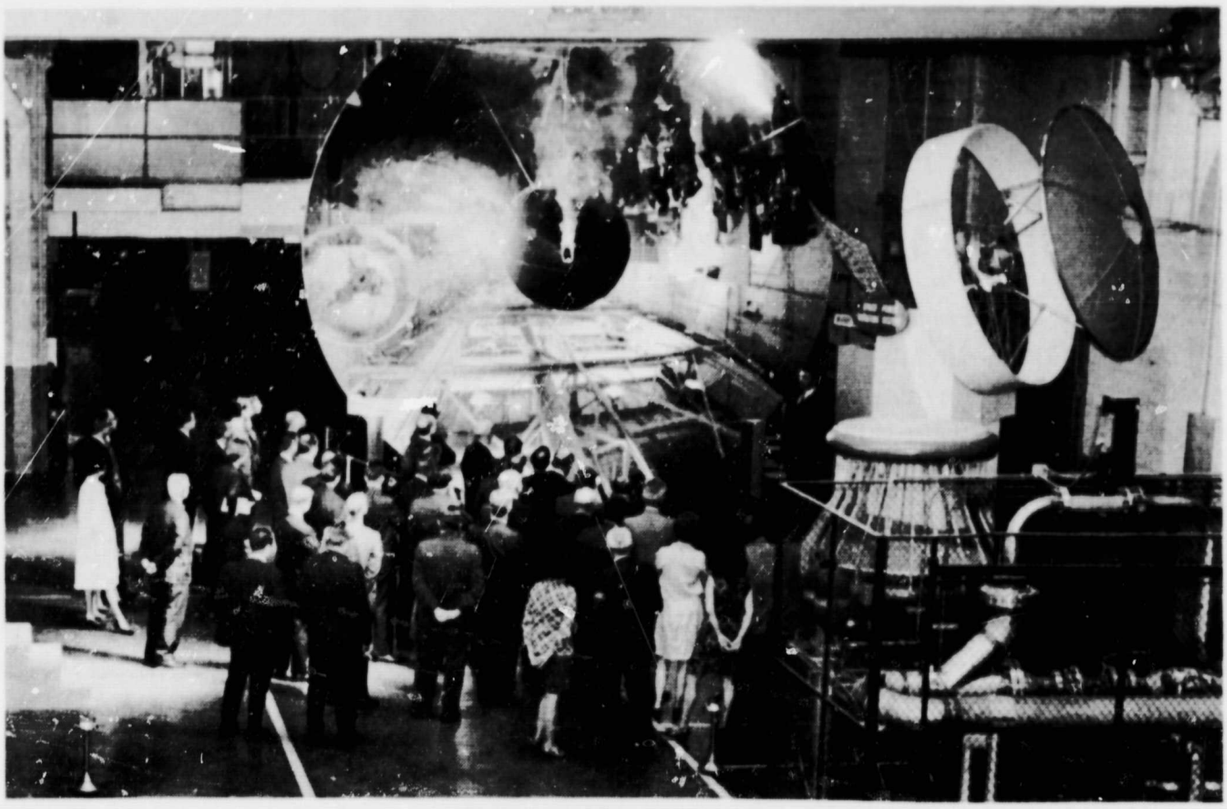
This survey of display systems connected with or updated by computer-generated information deals largely with console alphanumeric and graphic devices. Subjects covered include cathode-ray tubes, man-machine reactive input devices, computer systems, and checkout and control systems.

NASA SP–5049 1968 95 pp. GPO 60 cents



Eye motion is analyzed in scientific study of displays.

SYMPOSIA ON NEW TECHNOLOGY FOR INDUSTRY



Engineers inspecting a prototype solar mirror at the Lewis Research Center.

Selected Technology for the Electric Power Industry

Proceedings of a Lewis Research Center conference in September 1968 at which papers were presented on nuclear reactor heat sources, Rankine cycle power systems, Brayton cycle systems, direct energy conversion, superconductivity, and other topics of concern in the generation of electrical power, including: Reliability, instrumentation, automatic checkout and control, materials, bearings, and seals. NASA SP–5057 1968 321 pp. CFSTI $3.00

Nondestructive Testing: Trends and Techniques

The proceedings of the Second Technology Status and Trends Symposium, in October 1966, at the Marshall Space Flight Center. Technical papers discuss the examination of multilayer printed wiring boards by laminography, evaluation of adhesive bonded composite materials, ultrasonic analysis of aluminum, and X-ray television techniques for nondestructive testing. The nine papers in this newsy publication are highly illustrated. NASA SP–5082 1967 123 pp. GPO 55 cents

Conference on Selected Technology for the Petroleum Industry

A conference held at Lewis Research Center, December 8-9, 1965, to acquaint representatives of the petroleum industry with new technology resulting from the space effort. Choice of the topics was guided by a series of meetings between Lewis staff members and petroleum specialists.

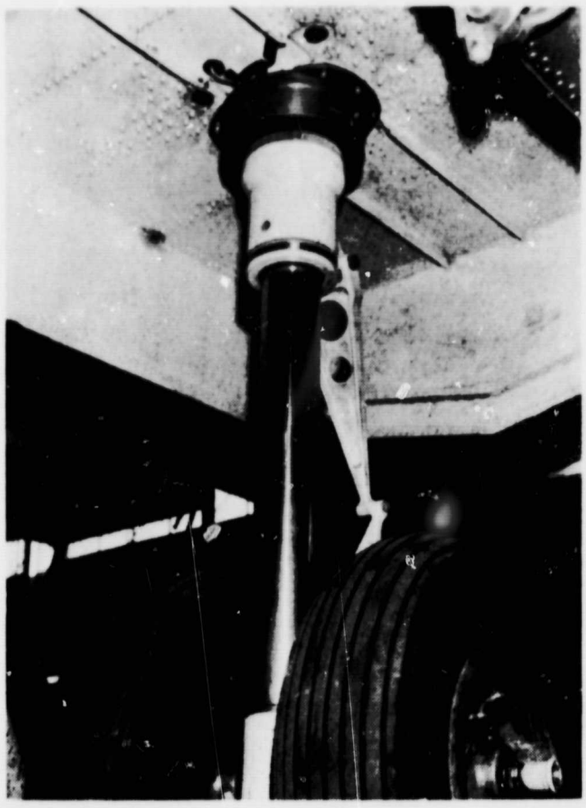
NASA SP–5053 1966 169 pp. GPO $1.25

The Metallurgy, Behavior and Application of the 18 Percent Nickel Maraging Steels

By A. M. Hall and C. J. Slunder

The structural strength and fracture toughness of 18 percent maraging steels, first announced in 1959, have prompted the use of these steels in industrial equipment, naval vessels, and aircraft. This survey of users and manufacturers summarizes and brings together compactly much of the available literature regarding the extraordinary properties and the potentialities of these steels. Dozens of tables and figures, 182 references, and a bibliography make this work by Battelle Memorial Institute specialists a handy guide for engineers, designers, and students.

NASA SP–5051 1969 137 pp.
GPO $1.50



Helicopter landing leg.

Application of Biogeochemistry to Mineral Prospecting

The relationships found between biological species and minerals, and the potentialities of remote sensing of the environment, are dealt with in this survey by personnel of the Rocketdyne Division of North American Rockwell Corp. Theoretical concepts are presented and possibilities of applying observations from high altitudes to prospecting for mankind's benefit are discussed.

NASA SP–5056 1968 135 pp. CFSTI $3.00

Induction Heating Advances: Applications to 5800° F

By A. F. Leatherman and D. E. Stutz

Complex objects are routinely brazed in a versatile and practical induction heating furnace designed at Lewis Research Center. In other Lewis furnaces, solid materials have been induction heated to above 5800° F. Specialists at Battelle Memorial Institute wrote this report, added an appendix reviewing basic principles of induction heating, and listed further sources of information about it.

NASA SP–5071 1969 41 pp. GPO 30 cents

Microelectronics in Space Research

Provides information on the contributions to the microelectronics field that have originated in NASA research programs. Also includes a review of the status of microelectronics, in which the limitations of the various technologies are highlighted. NASA SP–5031 1965 130 pp. GPO 60 cents

Vacuum Switchgear

By W. S. Emmerich

Technological advances in space work have increased the possibility of operating electrical switches in vacuum. NASA SP–5063 1964 36 pp. GPO 35 cents

DEXTROUS GENERAL-PURPOSE CYBERNETIC MACHINES

Teleoperators enable men to operate tools in hostile environments without personally entering those areas. These machines are extending and amplifying men's abilities in space, the depths of the oceans, and industrial plants. The same technology can help physically handicapped persons enjoy greater mobility.

In two Special Publications, Edwin G. Johnson, Facilities Chief of the Joint AEC-NASA Space Nuclear Propulsion Office, and William R. Corliss, a professional technical writer, have covered recent advances in teleoperator technology.

Teleoperators and Human Augmentation

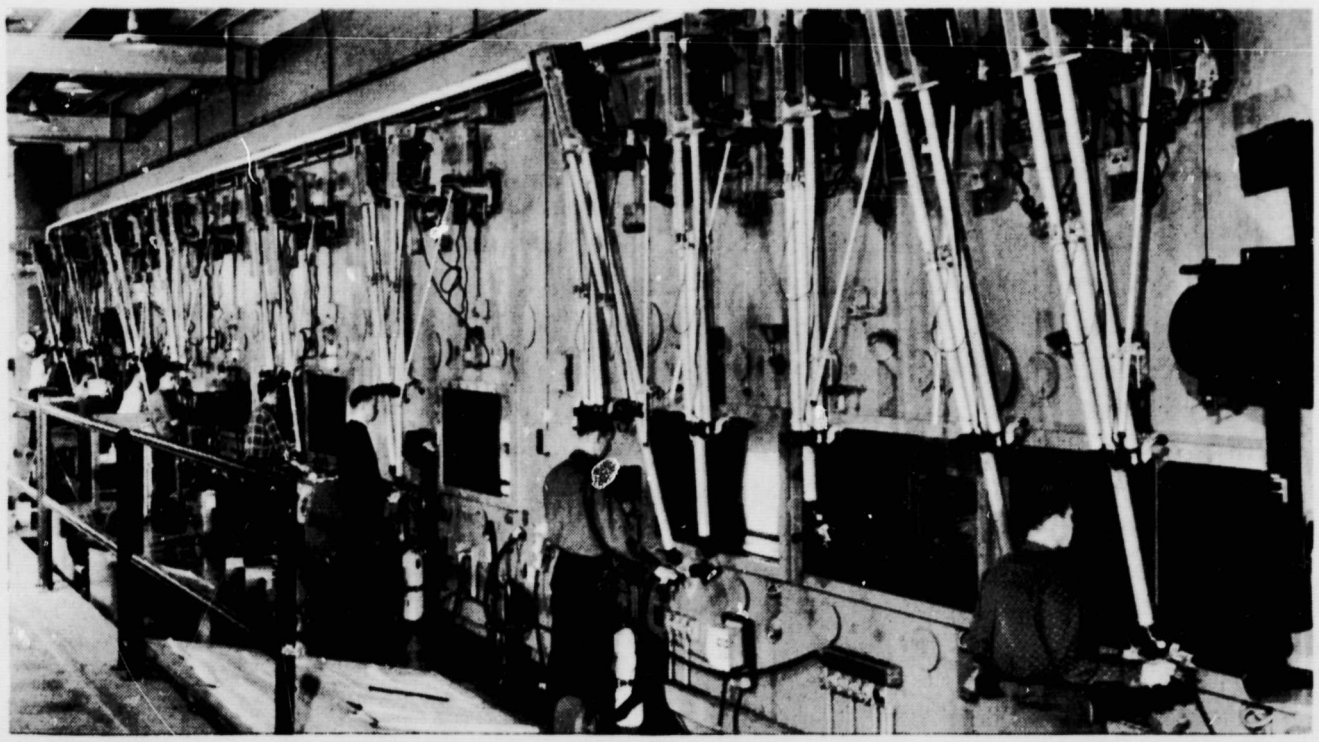
Teleoperator technology has germinated and grown independently in many fields, but most of the several thousand manipulator arms built in recent years have been used in atomic energy installations. This publication traces the evolution of design principles, and discusses the interfaces between men and machines. Eight principal subsystems of today's teleoperators are described in detail, with particular emphasis on actuating, sensing, and terminal devices. Similar systems, the authors argue, can free men from many dull, routine tasks.

NASA SP–5047 1968 265 pp. GPO $1.00

Teleoperator Controls

This sequel to NASA SP–5047 emphasizes controls of the machines that are helping to "hybridize man and machine." Coupled with advances in several sciences, Glenn T. Seaborg writes in the Foreword, teleoperators "will hopefully propel us toward a new society in which man can at last have time and resources to think and act in new directions and new dimensions." The authors give 292 references in support of their thesis.

NASA SP–5070 1969 162 pp. CFSTI $3.00



Rocket station workmen use wall-mounted, remotely controlled hands.

High-Velocity Metalworking

By M. C. Noland, H. M. Gadberry, J. B. Loser, and E. C. Sneegas

This is a comprehensive survey by the Midwest Research Institute of the new state of the arts of electromagnetic, electrohydraulic, pneumatic-mechanical, and explosive metalworking. By these processes, complex, finished surfaces, and close-tolerance parts in a great range of sizes can now be produced with less waste than by more conventional methods. The authors explain the fundamentals, point out the limitations, and emphasize the varied potentialities of all four processes. Separate chapters cover die design and material behavior at high strain rates. There are 290 illustrations and 192 references. NASA SP–5062 1967 183 pp. GPO $1.50

Effects of Low Temperatures on the Mechanical Properties of Structural Metals

By H. L. Martin, P. C. Miller, A. G. Imgram, and J. E. Campbell

This is a revised and enlarged edition of NASA SP–5012 (same title, 55 pp. GPO 40 cents) issued in 1964. It includes advances in the field since then, and contains data helpful to persons interested in gas liquefaction and separation, the storage and handling of cryogenic fluids, low-temperature heat exchange, quick freezing, superconductivity, and low temperature surgery.

NASA SP–5012(01) 1968 65 pp. GPO 50 cents

Pavement Grooving and Traction Studies

The proceedings of a conference held at Langley Research Center, November 18 and 19, 1968, includes 27 papers presented by various participating governmental and civil organizations engaged in a research program concerning aircraft operations on wet runways. Sessions on Aircraft Operational Problems, Aircraft Performance, Recent Skid Correlation Studies, and Surface Treatments To Improve Tire Traction on Highways are included.

NASA SP–5073 1969 512 pp. CFSTI $3.00

Technical and Economic Status of Magnesium-Lithium Alloys

By Paul D. Frost

Magnesium-lithium alloys, their general characteristics, current applications, and economic considerations for their future use. One objective is to report on the progress being made in the application of the new ultralight magnesium-lithium alloys in the space industry and to disseminate this information to those organizations not acquainted with the alloys and their applications. The second objective is to speculate on possible future usefulness of the alloys and to define technical and economic requirements for commercial use. NASA SP–5028 1965 45 pp. GPO 25 cents

Properties and Current Applications of Magnesium-Lithium Alloys

By R. J. Jackson and P. D. Frost

This is a compilation of engineering information on magnesium-lithium alloys. The mechanical properties and metallurgical characteristics for standard and developmental alloys are included. Various processing techniques, including cleaning and finishing, fabrication, casting, and joining, are discussed.

NASA SP–5068 1967 54 pp. GPO 40 cents

PRECIPITATION-HARDENING STAINLESS STEELS

Steels that resist corrosion and have high strength at high temperatures have figured importantly in the work of both the Atomic Energy Commission and NASA. Information regarding their use is available now in a series of AEC/NASA Handbooks. These reports were originally prepared by the Battelle Memorial Institute for the Manufacturing and Engineering Laboratory of the George C. Marshall Space Flight Center. They have been revised and updated by the authors for the benefit of other potential users of these steels.

Machining and Grinding of Ultrahigh-Strength Steels and Stainless Steel Alloys

By C. T. Olofson, J. A. Gurklis, and F. W. Boulger

NASA SP–5084 1968 202 pp. CFSTI $3.00

Adhesive Bonding of Stainless Steels — Including Precipitation-Hardening Stainless Steels

By R. E. Keith, M. D. Randall, and D. C. Martin

NASA SP–5085 1968 115 pp. CFSTI $3.00

Shaping of Precipitation-Hardening Stainless Steels by Casting and Powder Metallurgy

By J. G. Kura, V. D. Barth, and H. O. McIntire

NASA SP–5086 1968 42 pp. CFSTI $3.00

Welding of Precipitation-Hardening Stainless Steels

By J. J. Vagi, R. M. Evans, and D. C. Martin

NASA SP–5087 1968 181 pp. CFSTI $3.00

Deformation Processing of Precipitation-Hardening Stainless Steels

By D. E. Strobecker, A. F. Gerds, and F. W. Boulger

NASA SP–5088 256 pp. CFSTI $3.00

Thermal and Mechanical Treatment for Precipitation-Hardening Stainless Steels

By C. J. Slunder, A. F. Hoenie, and A. M. Hall

NASA SP–5089 1968 193 pp. CFSTI $3.00

Surface Treatments for Precipitation-Hardening Stainless Steels

By A. M. Hall

NASA SP–5090 1968 56 pp. CFSTI $3.00

Brazing and Brazing Alloys, a Bibliography

Identifies the current literature to provide industry with summaries of information obtainable in the aerospace field. NASA SP–5026 1967 52 pp. CFSTI $1.00

Contamination Control Principles

By H. D. Sivinski, W. J. Whitfield, and W. L. Clement

In this well publicized report, Willis J. Whitfield (whom Time Magazine calls "Mr. Clean") and his colleagues at the Sandia Corporation in Albuquerque, N. Mex., present a basic model for contamination control in pharmaceutical, electronic, and other industries where ultracleanliness is important. This is a guidebook for managers, foremen, and technicians. It deals with particulate, gaseous, liquid, radiation, and microbial contamination, and describes both stationary and portable clean work stations. Laminar air flow systems are emphasized, and fundamental principles are explained. NASA SP–5045 1967 55 pp. GPO 40 cents

Analytical Chemistry Instrumentation: A Survey

By Julia S. Whittick, R. F. Muraco, and Leonard A. Cavanagh

The alpha-scattering device used on the Moon for chemical analysis of its surface is one of many intriguing instruments described in this survey by Stanford Research Institute scientists. NASA contributions to ultraviolet, infrared, and X-ray spectroscopy, neutron-activation analysis, mass spectroscopy, gas chromatography, specific gas analyzers, vacuum equipment, and life-detection techniques are reviewed. "This book will attract lively interest among many scientists, technicians, and managers from the most varied fields," the reviewer of it wrote in the February 1969 issue of *Applied Optics*. NASA SP–5083 1967 134 pp. GPO 60 cents

Thermal Insulation Systems: A Survey

By Peter E. Glaser et al.

Aerospace work helpful to designers of such varied things as natural gas pipelines and surgical tools is reviewed in this survey by an internationally noted authority on solar furnaces and his colleagues at Arthur D. Little, Inc. Fundamental principles and measurement methods are discussed, as well as placement of insulation materials, the structure of multilayer systems, and supports for insulation.
NASA SP–5027 1967 148 pp. GPO 60 cents

Commercial Potentials of Semipermeable Membranes

By Sidney B. Tuwiner, Ernest J. Henley, and H. Kenneth Staffin

A survey of spacecraft-stimulated progress in producing and using membranes, including advances which have varied but impressive economic potentialities. Presented are data on new techniques and principles, membrane applications in batteries, advances in material science, level control in batteries, fuel cells, and various separation processes. NASA SP–5061 1967 45 pp. GPO 35 cents

Magnetic Tape Recording Technology

By Skipwith W. Athey

A survey of the entire range of recorder technology, with emphasis on two aspects of development in which NASA has played an important part. One is the area of miniature severe-environment tape recorders, for use in satellites and space probes. The other area is that of commercial, ground-based tape recorders.
NASA SP–5038 1966 326 pp. GPO $1.25

NASA Contributions to the Development of Special-Purpose Thermocouples

By C. Eugene Moeller, Michael Noland, and B. L. Rhodes

Applications of thermocouples to increase accuracy and reduce costs in a multitude of industries are suggested by this survey of new thermocouples and techniques of using them developed to meet NASA's varied and stringent needs. The developments described include thermocouples for cryogenic use and for measuring temperatures above 3000° F. The survey covers special probes for measuring gas temperatures, the temperatures of solids, and surface temperatures, and explains their use in energy-transfer gauges. NASA SP–5050 1968 94 pp. GPO $1.25

Adhesives, Sealants, and Gaskets

By R. B. Perkins and S. N. Glarum

A survey of adhesives, sealants, and gaskets developed to operate in the extreme environment of space that will interest specialists in the subject. The reliability of materials used in a liquid oxygen environment is emphasized. The following are described in detail: polymeric fillers in adhesives, elastomeric films in glue lines, epoxy ester adhesives, sealants for low-temperature service, gasket design, and measurement of stress in gaskets. NASA SP–5066 1967 63 pp. GPO 25 cents

Plasma Jet Technology

Compiled by P. R. Dennis, C. R. Smith, D. W. Gates, and J. B. Bond

This survey emphasizes the industrial potential of plasma generators in the testing, coating, and spraying of materials, in chemical synthesis, and in other industrial operations. It includes accounts of NASA contributions to such technology and the instrumentation involved. NASA SP–5033 1965 200 pp. GPO $1.00

Vibrating Diaphragm Pressure Transducer

This report, prepared under contract for NASA by Southwest Research Institute, describes the vibrating diaphragm pressure transducer developed at Ames Research Center for use in high-velocity wind tunnels. The instrument is used for sensing absolute gas pressures over the range of approximately 10^{-5} to 10^{3} mm Hg. With little or no modification, the transducer can be used as a differential capacitor pressure transducer, an electrometer input device, a magnetic damping measuring device, and an accurate multiplier for use with electronic analog computers.

NASA SP–5020 1966 27 pp. GPO 30 cents

Selected Welding Techniques, Parts I and II

Descriptions and illustrations of tools and techniques used in welding aluminum sheet and plate at Marshall Space Flight Center.

Part I NASA SP–5003 1964 25 pp. GPO 30 cents
Part II NASA SP–5009 1964 34 pp. GPO 30 cents

A "Bibliography on Welding Methods" is also available as NASA SP–5024 (1966 28 pp. CFSTI $3.00).

Structural Design Concepts: Some NASA Contributions

By L. Albert Scipio

Many aerospace contributions to structural design are applicable to buildings and other structures that need not fly. The author of this survey has summarized such advances in structural types, concepts, and design synthesis and optimization. He describes the development of materials associated with these advances, and gives examples of ways in which they may be used. This survey was written primarily for the designer and is being used as a college text. Eighty-one figures, scores of references, and a glossary are included.

NASA SP–5039 1967 174 pp. GPO 70 cents

Advanced Valve Technology

By Louis C. Burmeister, John B. Loser, and Eldon Sneegas

This is a second, greatly enlarged, and improved edition of a Midwest Research Institute survey of innovations that are helping to solve leakage, thermal, and reliability problems in a variety of fluid systems. It discusses materials compatibility, lubrication, and response time; valve actuators, position indicators, and computer control. NASA SP–5019 1967 183 pp. GPO $1.00

Solid Lubricants

By M. E. Campbell, John B. Loser, and Eldon Sneegas

A survey of the state of development of solid lubricants, including types and specifications, commercial applicability, cost factors, theory, and new developments in the field. Methods of evaluating solid-film lubricants and the test apparatus are also discussed. NASA SP–5059 1966 115 pp. GPO 50 cents

A "Bibliography on Solid Lubricants" also has been published as NASA SP–5037 (1966 14 pp. CFSTI $3.00).

NASA Contributions to the Technology of Inorganic Coatings

By Jerry D. Plunkett

A survey of NASA's contributions in the areas of thermophototropic coatings, thermal control for space vehicles, solid-lubrication coatings, thermal-insulation coatings, application of coatings to substrates, and measurement of coating optical properties, and refractory metal oxidation-resistant coatings.

NASA SP–5014 1964 268 pp. GPO $1.00

Soldering Electrical Connections, 4th Edition

Prepared under the direction of James A. Gay, Jr.

Diagrams, photographs, and detailed instructions covering dependable techniques for making different kinds of electrical connections.

NASA SP–5002 1967 66 pp. GPO 30 cents

NASA Contributions to Metals Joining

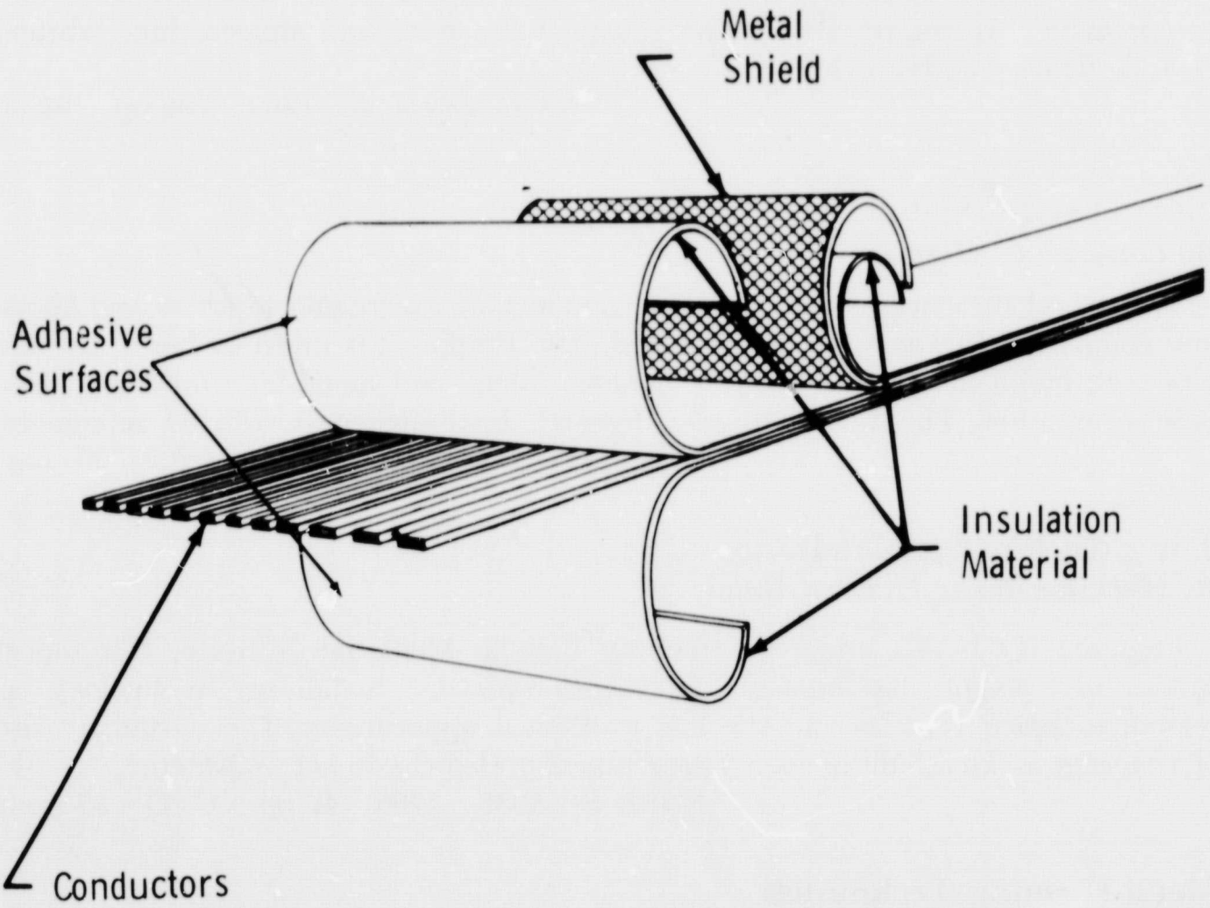
By W. J. Reichenecker and J. Heuschkel

This survey covers the many developments in joining metals by mechanical fasteners, soldering, brazing, welding, and plasma spray bonding, reported between 1962 and mid-1965. NASA SP–5064 1967 141 pp. GPO 60 cents

Flat Conductor Cable Technology

Flat conductor cable is often more compatible with modern circuit designs than round wire. Marshall Space Flight Center has been active in developing flat conductor cable technology for a dozen years to save weight and increase reliability. This report presents technical information for engineers considering its use.

NASA SP–5043 1968 49 pp. GPO 40 cents



Schematic drawing shows insulation and shielding on flat conductor cable.

Selected Electronic Circuitry

Describes specific innovations derived from space programs that appear to be useful generally. Information is included on amplifier, oscillator, multivibrator, waveshaping, temperature-compensation, and control circuits. Special computer circuits are also included. NASA SP–5046 1967 100 pp. GPO 70 cents

Welding for Electronic Assemblies

This handbook covers the theory, requirements, and fundamental techniques of interconnecting electronic components by resistance spot welding. A thorough understanding of the theory of resistance spot welding along with good workmanship and process control are the factors necessary to attain the required reliability. Glossary. NASA SP–5011 1964 81 pp. GPO 40 cents

Bibliography on Electromechanical Transducers

Annotated bibliography of current literature on the applications and uses of electromechanical transducers, with subject and author indexes.

NASA SP–5036 1966 20 pp. CFSTI $3.00

NASA Contributions to Fluid-Film Lubrication

By H. C. Rippel, Otto Decker, and Z. Zudans

Space exploration has been a driving force in advances in fluid-film lubrication, these Franklin Research Institute authors show in this illustrated, technical account of the new state of the art. The applications described range from those in precision-guidance apparatus aboard spacecraft to the support of the 80-foot-diameter antennas that track deep-space probes. The coverage includes incompressible and compressible hydrostatic and hydrodynamic lubrication and squeeze-film lubrication. A glossary adds to this work's value as a text.

NASA SP–5058 1969 196 pp. $2.00

Nonglassy Inorganic Fibers and Composites

By Cameron G. Harman

This report presents information about non-metallic, inorganic whiskers and fibers, and composites that may be useful to industry. Emphasis is given to boron carbide whiskers, boron filaments, refractory ceramic fibers, and metal-fiber-reinforced metallic composites. This is a Southwest Research Institute report with 61 references.

NASA SP–5055 1966 44 pp. GPO 35 cents

Tungsten Powder Metallurgy

By V. D. Barth and H. O. McIntire

Prepared for NASA under contract by Battelle Memorial Institute, this report summarizes recent developments in tungsten-powder metallurgy technology as related to space vehicles and the less traditional applications. The customary use of tungsten as a carbide or as a minor alloying element is not considered.

NASA SP–5035 1965 40 pp. GPO 35 cents

Metal-Forming Techniques

By Ilia I. Islamoff

Outlines recent metal-forming methods for sheet and plate materials used by the aircraft and aerospace industries, and describes particularly the techniques employed at present, some of which, like magnetic forming and hot-drape forming, are in experimental stages. NASA SP–5017 1965 52 pp. GPO 40 cents

Mathematical Computer Programs

Several mathematical programs and programing techniques for digital computers which are available through the NASA Technology Utilization program are outlined. Although the functions that the programs perform are not new, and similar programs are available in many large computer center libraries, the collection may be useful to centers with limited systems libraries for instructional purposes for new computer operators. NASA SP–5069 1967 26 pp. CFSTI $1.00

Some New Metal and Metal-Ceramic Composites

This report is designed to show industrial management the current state of development of some composite materials, including dispersion-strengthened composites, fiber composites, and reinforced ceramics.

NASA SP–5060 1966 26 pp. GPO 25 cents

Assessing Technology Transfer

By Richard L. Lesher and George J. Howick

An abridgement of a report prepared for the National Commission on Technology, Automation, and Economic Progress, which was established in August 1964. Considered are such questions as the value of technology transfer as a national goal, the sufficiency of sources for such transfer, incentives and barriers, transfer mechanisms or channels used to date, and elements essential to effective transfer. The authors conducted depth interviews with persons in Government agencies that have technology-transfer and information dissemination programs.

NASA SP–5067 1966 121 pp. GPO 50 cents

Applications of Systems Analysis Models

This survey is addressed primarily to managers outside the aerospace industry who may benefit from an understanding of new management techniques that NASA has helped to develop. It describes mathematical models and systems analysis technology applicable to a wide range of large-scale complex undertakings in both the public and the private sectors of the economy. It discusses in particular the application of such technology to urban and regional planning, and points out its potential helpfulness to city officials and administrators of public health, education, and other programs in the public interest.

NASA SP–5048 1968 69 pp. GPO 50 cents

Symposium on Technology Status and Trends

Proceedings of a conference at Huntsville, Ala., April 21–23, 1965, sponsored by the Technology Utilization Office of Marshall Space Flight Center for representatives of nonaerospace industry. NASA SP–5030 1966 248 pp. GPO $1.50

Conference on New Technology

Proceedings of a conference at Lewis Research Center, June 4–5, 1964, to discuss ways of transferring applicable space-research knowledge to the industrial community. NASA SP–5015 1964 156 pp. GPO $1.00

The Electromagnetic Hammer

This report describes a method of using a pancake electromagnetic coil driven by electric-discharge equipment to smooth out nonferrous metal components such as welded rocket fuel tanks, gore segments, and bulkheads.

NASA SP–5034 1965 22 pp. GPO 25 cents

Elastic Orifices for Gas Bearings

Test data indicate superiority of such a system over pressurized liquid and rolling-contact bearing systems. NASA SP–5029 1965 11 pp. GPO 20 cents

Precision Tooling Techniques

Describes devices with possible industrial applications, developed at NASA's Marshall Space Flight Center. NASA SP–5013 1964 25 pp. GPO 25 cents

Concise Announcements

A NASA Tech Brief is a one- or two-page announcement. Many of these briefs simply state a specific problem, a solution, and a source of additional information. Others notify readers of the availability of new concepts, hardware, and software resulting from NASA research and development activities.

An AEC-NASA Tech Brief is issued jointly by the Atomic Energy Commission and NASA regarding work these agencies have sponsored either separately or jointly.

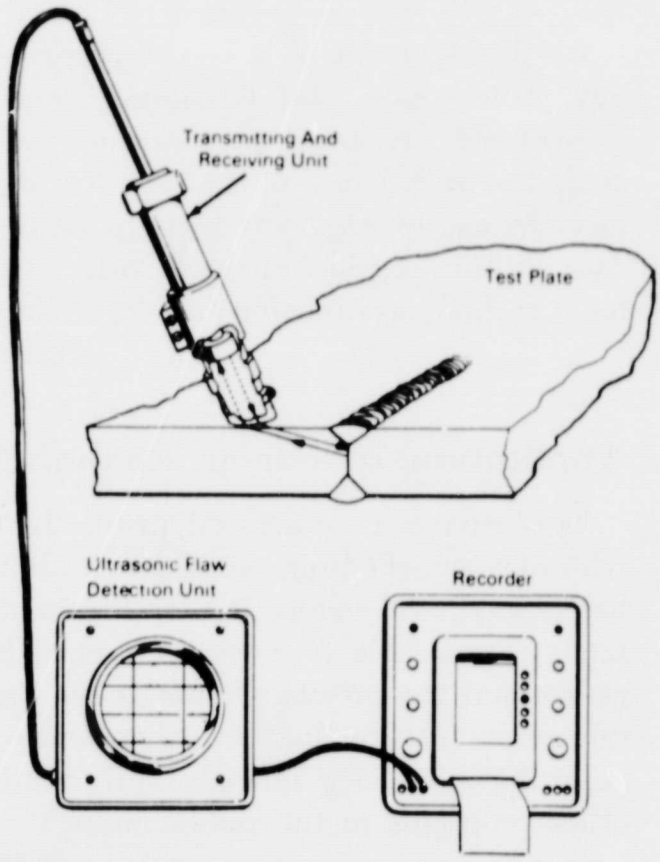
Tech Briefs are issued to encourage commercial use of findings reported by Government researchers and companies serving Government agencies. NASA neither guarantees the originality of the contents nor assumes any liability for the use of information contained in these brief reports.

Six categories of Tech Briefs are now distributed on a subscription basis. Annual subscription rates for single categories are:

Electrical (electronic)	$6.00
Energy Sources	2.50
Materials (chemistry)	5.00
Life Sciences	2.50
Mechanical	6.00
Computer Programs	6.00

An annual subscription to all six categories costs $20. Tech Briefs in the first five categories above have been issued since 1963. NASA Tech Briefs announcing Computer Programs were first issued in late 1967.

Cumulative Indexes to NASA Tech Briefs are available for $3 each. These indexes contain titles, brief descriptions, and number of nearly 3000 Tech Briefs.



Mechanized ultrasonic scanning.

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